

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification⁶ : C07K 16/28, 14/72, C12N 5/00, A61K 39/00</p>	<p>A1</p>	<p>(11) International Publication Number: WO 95/09186 (43) International Publication Date: 6 April 1995 (06.04.95)</p>
<p>(21) International Application Number: PCT/GB94/02100 (22) International Filing Date: 27 September 1994 (27.09.94) (30) Priority Data: 9319877.8 27 September 1993 (27.09.93) GB (71) Applicant (for all designated States except US): QUEEN MARY AND WESTFIELD COLLEGE [GB/GB]; Mile End Road, London E1 4NS (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): VINSON, Gavin, Paul [GB/GB]; Queen Mary and Westfield College, Mile End Road, London E1 4NS (GB). BARKER, Stewart [GB/GB]; Queen Mary and Westfield College, Mile End Road, London E1 4NS (GB). (74) Agent: MARCH, Gary, Clifford; Batchellor, Kirk & Co., 2 Pear Tree Court, Farringdon Road, London EC1R 0DS (GB).</p>		<p>(81) Designated States: AU, CA, GB, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: TYPE I ANGIOTENSIN II RECEPTOR SPECIFIC MONOCLONAL ANTIBODIES AND HYBRIDOMAS (57) Abstract The present invention relates to a novel hybridoma cell line which secretes monoclonal antibodies capable of binding to the AT₁ subtype of the Angiotensin II receptor. It also relates to monoclonal antibodies secreted by the hybridoma, which antibodies may be used in diagnostic test kits as well as having therapeutic applications.</p>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

- 1 -

TYPE I ANGIOTENSIN II RECEPTOR SPECIFIC MONOCLONAL ANTIBODIES AND HYBRIDOMAS.

The present invention relates to a novel hybridoma cell line, in particular it relates to a novel hybridoma cell line which secretes monoclonal antibodies capable of binding to the AT₁ subtype of the Angiotensin II receptor (AT₁ receptor). The invention also relates to monoclonal antibodies secreted by the hybridoma, which antibodies may be used in a test kit having several diagnostic and monitoring applications. It also relates to the use of the monoclonal antibodies in therapeutic applications such as the control of smooth muscle stimulation.

The hormone angiotensin II (Ang II) forms part of the renin - angiotensin system which helps to control electrolyte balance and blood pressure within the body. There are several tissues within the body upon which Ang II acts, they include the adrenal gland, uterus, liver, brain and kidney.

Amongst the several established functions of angiotensin II, it is known to stimulate smooth (unstriated) muscle cell contraction. It stimulates the contraction of smooth muscle cells in the blood vessel wall thus causing vaso-constriction, which leads to hypertension. Most treatments for high blood pressure will include blockage of angiotensin function in one way or another. Smooth muscle also occurs in other locations, for example in the uterus and in the gastrointestinal tract, and elsewhere.

Ang II also stimulates the secretion of aldosterone by the adrenal cortex. Aldosterone is a potent hormone which acts primarily on the kidney to promote sodium retention and thus inter alia, heightens the hypertensive effects of angiotensin acting directly on the vasculature.

Ang II is known to act on various sites in the brain, and one of its actions in animals is the regulation

- 2 -

of thirst and drinking.

Angiotensin also has trophic effects on the vasculature, promoting growth of the muscles in the arterial wall. It is also thought to be angiogenic, i.e. it causes vascularisation of newly developing tissue.

The actions of angiotensin II in cells are mediated through two important intracellular signalling mechanisms. When the hormone binds to its receptor, it activates a specific enzyme, phospholipase C, which acts upon a constituent of the cell membrane called phosphatidyl inositol. This is split by the enzyme into two moieties, called inositol trisphosphate (IP₃), and diacylglycerol (DAG). Both of these are involved in eliciting further effects within the target cell. IP₃ stimulates increased cellular cytosolic calcium concentrations, which in turn evokes other cellular responses, whereas DAG stimulates another specific enzyme called protein kinase C (PKC).

Most of the established effects of Ang II have been found to occur via the AT₁ subtype of the Ang II receptor, which is a seven transmembrane domain receptor. This receptor has been cloned and sequenced from a variety of tissues, and has been found to be a 359 amino acid polypeptide with a predicted molecular weight of around 40kD (Bernstein and Alexander, (1992), Endocr. Rev., **13**, 381-386). Studies using photo-affinity labelling and crosslinking agents have suggested molecular weights for mature receptor of approximately 65kD and 116 kD, respectively, which may reflect glycosylation of asparagine residues within the extra-cellular domain.

Whilst polyclonal antibodies and anti-idiotypic antibodies have been prepared to the Ang II receptor, from which it has been postulated that the receptor has a molecular weight of from 60 to 95 kD, and 63 kD respectively, to date no-one has succeeded in preparing a

- 3 -

monoclonal antibody to this receptor.

It has now been found that by immunising mice with a synthetic peptide corresponding to amino acid residues 8-17 of the rat vascular smooth muscle AT₁ receptor (Murphy, T.J. et al, (1992), Nature, 351, 233-236), and thereafter fusing spleen cells from the immunised mice with mouse myeloma cells, a novel hybridoma cell line is produced, which secretes monoclonal antibodies to the AT₁ subtype of the Ang II receptor.

According to one aspect of the invention there is provided a hybridoma cell line which produces monoclonal antibodies capable of binding to the AT₁ subtype of the angiotensin II receptor. A hybridoma cell line that secretes such monoclonal antibodies was deposited on 22 July 1993 with the European Collection of Animal Cell Cultures, Porton Down, United Kingdom, under the Budapest Treaty, and designated accession No. 93072117.

Such a hybridoma cell line produces antibodies which bind specifically to amino acid residues 8 to 17 of the rat vascular smooth muscle AT₁ receptor. It was found, however, that the monoclonal antibodies would bind to the AT₁ receptor in bovine and human tissue, as well as in rat tissue. To date this sequence of amino acid residues has been found, and is therefore conserved, in all mammalian AT₁ receptors so far cloned. Thus the hybridoma cell line produces antibodies that bind specifically to a peptide having the following amino acid sequence:-

H₂N-Glu- Asp- Gly- Ileu- Lys- Arg- Ileu- Gln- Asp- Asp- -COOH

According to a second aspect of the invention there is provided a monoclonal antibody that binds to the AT₁ subtype of the angiotensin II receptor. Such monoclonal antibodies bind specifically to amino acid residues 8-17 of

- 4 -

the mammalian AT₁ receptor, that is they bind specifically to a peptide having the amino acid sequence given above.

A hybridoma cell line, according to the invention, can be prepared by immunising inbred mice by techniques well known in the art (Kohler and Milstein, (1975), Nature, 256, 495-497). A peptide was synthesised which corresponds to amino acid residues 8-17 (extracellular) of the published rat vascular smooth muscle AT₁ receptor. The peptide was then conjugated to bovine serum albumin (BSA) and used to immunise mice.

Following a booster injection of the peptide-BSA conjugate the mouse spleens were removed, and the spleenocytes were combined with mouse myeloma cells. Mixed myeloma - lymphocyte hybrids were selected by growth in hypoxanthine, thymidine and aminopterin in an appropriate cell culture medium.

The presence of hybridoma cell lines producing monoclonal antibodies to the AT₁ subtype of the angiotensin II receptor was first detected by screening the hybridoma conditioned medium for binding to a rat liver cell suspension. Such positive binding was detected using peroxidase - conjugated rabbit anti-mouse immunoglobulin (IgG) antibody. Following the initial screening, cell cultures showing positive results were expanded and tested for specific binding to rat adrenal glomerulosa on both frozen sections and dispersed cell smears, using a fluorescein-conjugated rabbit anti-mouse (IgG) antibody. The integrity of the anti-AT₁ receptor monoclonal antibodies produced by the hybridoma was confirmed by binding to rat AT_{1A} receptor transiently expressed by transfected Cos-7 cells.

The monoclonal antibodies of the present invention may be tagged with compounds that fluoresce at various wavelengths, so that the location and distribution of AT₁

- 5 -

receptors in body tissues can be determined by immunohistological techniques. For example, using this monoclonal antibody AT₁ receptors have been found in breast tumours, thus the antibody may be useful in the cancer diagnostic field.

In addition, using the monoclonal antibody of the present invention a hitherto unknown site of action for Ang II has been discovered. It has been found that both rat and human sperm tails express the angiotensin II receptor, and the physiology of the regulation of its expression leads to the possibility that the hormone may be profoundly important in the control of sperm motility, with a potential effect on male fertility. The monoclonal antibodies of the present invention may thus be used in a standard radioimmuno-assay or enzyme-linked immunosorbant assay to study, and possibly measure, sperm motility, as well having a use in contraception.

According to a further aspect of the invention there is provided a diagnostic test kit comprising the monoclonal antibodies of the present invention attached to a detectable label. Such detectable labels include radioisotopes, enzymes and fluorescent compounds.

It has been found that addition of the monoclonal antibodies according to the present invention to living cells inhibits the angiotensin II-generated IP₃ response, but it has no action on PKC activation. Thus the antibody interacts highly specifically with just one of the two major signalling pathways stimulated by angiotensin II. This property can be used experimentally to discriminate between the effects of these two pathways, as well as in therapeutic applications. For example, the monoclonal antibodies may be used in controlling vaso-constriction and therefore used to treat hypertension, as well as for the regulation of menstruation and the control of uterine contractions to

- 6 -

prevent miscarriage.

Furthermore these monoclonal antibodies can be used in both immunohistochemistry and immunoelectron-microscopy, and may have applications in immunoblotting and immunocytological staining.

The invention is illustrated by the following example.

Example 1

Peptide Synthesis

A peptide was synthesised corresponding to amino acid residues 8-17 (extracellular) of the published rat vascular smooth muscle AT₁ receptor, with the addition of a cysteine residue to facilitate subsequent conjugation to bovine serum albumin (BSA) at either the carboxy-terminal end or the amino terminal end respectively, via an N-Succinimidyl 3-(2-pyridyldithio) proprionate (SPDP) bridge. The synthesis was carried out using Fmoc chemistry on an automated synthesiser, followed by reverse phase HPLC. Fmoc chemistry is the use of fluorenylmethoxy carbonyl protected amino acids in peptide synthesis.

Immunogen preparation and Immunisation

To prepare the peptide-BSA conjugates, a 0.22mM solution of BSA, in degassed 100mM sodium phosphate buffer containing 100mM sodium chloride (SPSC buffer; pH 7.5), was 'activated' by incubation for 60 min at room temperature with 20mM SPDP (in absolute ethanol) at a ratio of 9:1 (v/v) followed by dialysis in SPSC buffer. 3mg of peptide in 1.2ml SPSC buffer was then incubated with 6ml of 'activated' BSA for 60 min at room temperature, followed by further dialysis in SPSC buffer. Balb C/c mice (8 weeks old) were then immunised by subcutaneous injection with 0.2 ml of a 1:1 emulsion of peptide-BSA conjugate in SPSC buffer (representing approximately 400 µg/ml peptide) and Freund's complete adjuvant. This was followed by a booster injection

- 7 -

four weeks later using a similar emulsion of peptide conjugate in Freund's Incomplete adjuvant. Four days later the mouse spleens were removed.

Production of Hybridomas

Sp2/0-Ag-14 mouse myeloma cells were cultured in RPMI 1640 medium supplemented with 20% (v/v) fetal bovine serum (FBS). These myeloma cells were combined with spleen cells obtained from the immunised mice, and the formation of fused hybrids was aided using 40% (v/v) polyethylene glycol. Mixed myeloma-lymphocyte hybrids were selected by culture in 96-well plates using RPMI containing 20% FBS and hypoxanthine (13.6 mg/l), aminopterin (0.19 mg/l) and thymidine (3.88mg/l) (HAT) (Galfre and Milstein, (1981), Methods Enzymol., 73, 3-46).

After 14 days of HAT selection, hybridoma conditioned medium was removed and screened for binding to a rat liver cell suspension, which had been washed thoroughly with serum-free medium and fixed, using 3.7% (v/v) formaldehyde in 10mM phosphate buffered saline (PBS; pH 7.3), on to poly-L-lysine coated 96-well plates. A peroxidase-conjugated rabbit anti-mouse immunoglobulin (IgG) antibody was used to detect positive binding, and this was visualised, as a brown colouration, with diaminobenzidine (DAB) reagent containing imidazole. After initial screening, cells from positive wells were expanded into 24-well plates and cultured in RPMI 1640 containing 20% Myoclone (obtained from Gibco BRL, Uxbridge, UK), and hypoxanthine (13.6mg/l) and thymidine (0.19mg/l), supplemented with 10% v/v thymocyte conditioned medium. Conditioned media from expanded cultures were then tested for specific binding to rat adrenal glomerulosa on both frozen sections and dispersed cell smears, using a fluorescein-conjugated rabbit anti-mouse IgG as described by Laird, S.M, et al in Acta Endocrinologica (Copenh.) (1988)

- 8 -

19, 420-426. Glomerulosa specific populations were then cloned by limiting dilution as described by Goding, J.W. in J. Immunol. Methods, (1980), 39, 285-306.

Transfected AT₁ receptor preparation

Rat AT_{1A} receptors were transiently expressed in COS-7 cells as described by Barker, S., et al in Biochem Biophys. Res. Commun., (1993), 192, 392-398. Cells were sonicated, on ice, in 50mM Tris-HC buffer (pH 7.4) containing aprotinin (1µg/ml), soybean trypsin inhibitor (1µg/ml), phenyl methyl sulfonyl fluoride (30µg/ml and ethylene diamine tetra-acetic acid EDTA (300µg/ml), and centrifuged at 800g for 5 min at 4°C. The resultant supernatant was centrifuged at 100 000g for 1 hour at 4°C. The particulate fraction was then resuspended in the above buffer and diluted to give 100 µg protein/25µl. The Screening and Cloning preparation was then incubated for 30 min at 4°C in the presence of 1% (v/v) Triton x100 (Trade Mark) to solubilise membrane proteins. Sham-transfected COS-7 cells were treated similarly.

Gel electrophoresis and immunoblotting

100µg of solubilised proteins, obtained from the membrane fraction of COS-7 cells, prepared as described above, was loaded in each well and proteins were separated by sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) on an 8% gel, running at 200v for approximately 4 hours. Molecular weight markers (106 kD-18.5 kD) were also loaded. Proteins were then electro transferred to Hybond-Enhanced chemiluminescence (ECL) nitrocellulose membranes overnight at 200mA. The membranes were blocked using PBS containaing 10% (w/v) milk protein for 1 hour at room temperature. After washing thoroughly with PBS containing 0.1% (v/v) Tween 20 (Trade Mark) (PBS-T), membranes were incubated with primary antibody (1:20 v/v

- 9 -

in PBS-T) for 1 hour at room temperature. Membranes were washed with PBS-T as before, and then incubated for a further hour at room temperature with horseradish peroxidase-linked sheep anti-mouse Ig antibody, at a dilution of 1:5000 in PBS-T. Following further thorough washing with PBS-T, membranes were treated with ECL reagent and chemiluminescence was detected by exposure to Hyperfilm-ECL.

Results

Amongst the hybridoma clones of interest was one which secreted antibody, and which has been deposited as cell line accession No. 930720117 with the European Collection of Animal Cell Cultures, Porton Down, UK. To confirm that this cell line truly produced antibody that recognised AT₁ receptor, SDS-PAGE and immunoblotting of solubilised proteins obtained from the membrane fraction of COS-7 cells transfected with rat adrenal AT_{1A} receptor cDNA were carried out as described above. Figure 1 shows that the antibody produced by this cell line identified two prominent protein species with approximate molecular weights of 40 and 60 kG. These were not detected in parallel samples from sham-transfected COS-7 cell controls.

- 10 -

Example 2Use of monoclonal antibodies to control sperm motility

Human sperm samples were obtained from 12 volunteers and patients attending the Newham Hospital assisted fertility clinic. Samples were suspended in modified minimum essential medium with Earle's salts (MEM) and glutamine and viewed in a Makler chamber using an Olympus inverted microscope fitted with an Olympus ARTF-2 video camera. Fields were recorded on video tape and percentage motility evaluated.

Percentage motility was estimated on playback of the video tapes by freezing the frame to count all of the sperm within a field and then, in forward mode, by counting immotile sperm, i.e. those which within the period of observation did not move to an adjacent square (100 μ metre) on the Makler Chamber grid. In practice, rigid use of this definition was rarely necessary as sperm were either completely immotile or progressed freely.

One series of samples was kept as controls. To a second series Angiotensin II amide (10 nmole/l) was added. A third series was treated with monoclonal antibody to the AT₁ receptor before angiotensin was added.

Velocity was measured by timing forwardly progressive sperm traversing the grid on the Makler Chamber and timing them manually.

From Figure 2(a) it can be seen that stimulation with angiotensin II significantly stimulated forward progressive velocity compared with the untreated controls, whilst addition of the monoclonal antibody inhibited the response to angiotensin II.

From Figure 2(b) it can be seen that similar results were obtained for the effect on the percentage of motile sperm.

- 11 -

Example 3Effect of monoclonal antibody on smooth muscle contractility in the rat uterus

The uterus was excised from a Wistar rat (350g), and placed in minimum essential medium (MEM) and kept at room temperature. The organ was cleared of fat and a piece of tissue 3cm long was cut from one horn and tied, using sutures, on to a basal isotonic transducer, which was linked to an analogue to digital converter. The resultant signal was analysed by computer using Chart software. A small weight (Approx. 1g) was applied to take up tissue slack. The tissue was then totally immersed in incubation medium (MEM) in an isolated organ bath maintained at 37°C, and incubated until regular contractions of constant amplitude were observed. Fresh medium was applied and the tissue was once again allowed to equilibrate. The effects of angiotensin II, and monoclonal antibody on the rate and amplitude of contraction was assessed by adding these agents directly to the organ bath. The tissue was washed in several changes of medium between different test conditions.

From Figure 3(a) it can be seen that, when angiotensin II at 0.1nmole/l was added, at arrow (A), the amplitude and frequency of subsequent uterine contractions

was significantly increased.

From Figure 3(b) it can be seen that subsequent addition of monoclonal antibody, at arrow (B), inhibited the rate and intensity of the contractions to below, not only the angiotensin stimulated level, but also the basal level.

- 12 -

SEQUENCE LISTING

(1) GENERAL INFORMATION

(i) APPLICANT

(A) NAME: Queen Mary & Westfield College
(B) STREET: Mile End Road
(C) CITY: London
(E) COUNTRY: United Kingdom
(F) POSTAL CODE (ZIP): E1 4NS

(A) NAME: VINSON, Gavin ~~R~~ - Queen Mary &
Westfield College
(B) STREET: Mile End Road
(C) CITY: London
(E) COUNTRY: United Kingdom
(F) POSTAL CODE (ZIP): E1 4NS

(A) NAME: BARKER, Stewart - Queen Mary &
Westfield College
(B) STREET: Mile End Road
(C) CITY: London
(E) COUNTRY: United Kingdom
(F) POSTAL CODE (ZIP): E1 4NS

(ii) TITLE OF INVENTION: NOVEL HYBRIDOMA & MONOCLONAL
ANTIBODIES PRODUCED THEREBY

(iii) NUMBER OF SEQUENCES: 1

- 13 -

(iv) COMPUTER READABLE FORM:

(A) MEDIUM TYPE: Floppy disk
(B) COMPUTER: IBM PC Compatible
(C) OPERATING SYSTEM: PC - DOS/MS - DOS
(D) SOFTWARE: PatentIn Release # 1.0, Version # 1.25 (EPC

(v) CURRENT APPLICATION DATA:

APPLICATION NUMBER: PCT/GB94/

(vi) PRIOR APPLICATION DATA:

(A) APPLICATION NUMBER: GB 9319877.8
(B) FILING DATE: 27-SEPT-1993

(2) INFORMATION FOR SEQ ID NO:1:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH:
(B) TYPE: amino acid
(C) STRANDEDNESS: unknown
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(vi) ORIGINAL SOURCE:

(H) CELLINE: Hybridoma

(xi) SEQUENCE DESCRIPTION: SEQ ID NO 1:

Glu Asp Gly Ileu Lys Arg Ileu Gln Asp Asp
1 5 10

- 14 -

CLAIMS

1. A hybridoma cell line which produces monoclonal antibodies capable of binding to the AT₁ subtype of the angiotensin II receptor.

2. A hybridoma cell line according to claim 1 which produces monoclonal antibodies that bind specifically to amino acid residues 8-17 of the mammalian AT₁ receptor.

3. A hybridoma cell line which produces monoclonal antibodies that bind specifically to a peptide having the amino acid sequence

H₂N-Glu- Asp- Gly- Ileu- Lys- Arg- Ileu- Gln- Asp- Asp- -COOH

4. A hybridoma cell line according to claim 1 being characterised by cell line accession No. 930720117 deposited at European Collection of Animal Cell Cultures, Porton Down, UK.

5. A monoclonal antibody that binds to the AT₁ subtype of the angiotensin II receptor.

6. A monoclonal antibody according to claim 5 that binds to amino acid residues 8-17 of the mammalian AT₁ receptor.

7. A monoclonal antibody that binds specifically to a peptide having the amino acid sequence

H₂N-Glu- Asp- Gly- Ileu- Lys- Arg- Ileu- Gln- Asp- Asp- -COOH

8. Use of the monoclonal antibody according to any

- 15 -

one of claims 5 to 7 for the detection of AT₁ subtype of angiotensin II receptor.

9. Use of the monoclonal antibody according to any one of claims 5 to 7 for the control of vaso-constriction.

10. Use of the monoclonal antibody according to any one of claims 5 to 7 for the control of uterine contractions.

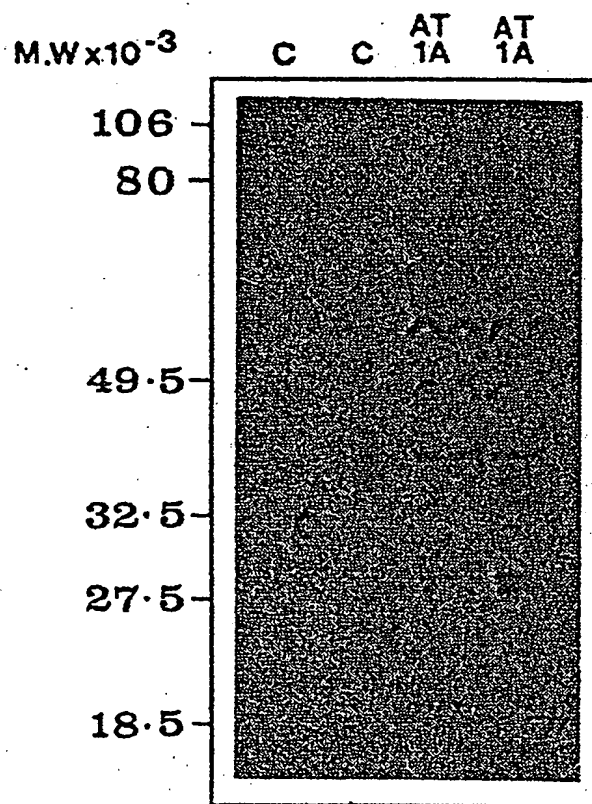
11. A diagnostic test kit comprising the monoclonal antibody of according to any one of claims 5 to 7 attached to a detectable label.

12. A method of treating hypertension comprising administering a therapeutic effective amount of a monoclonal antibody according to any one of claims 5 to 7.

13. A method of controlling uterine contractions comprising administering a therapeutic effective amount of a monoclonal antibody according to any one of claims 5 to 7.

1/4

FIG. 1



Immunoblot of solubilised membrane proteins from control COS-7 cells (C), and COS-7 cells expressing rat adrenal AT₁A receptors using anti-AT₁ monoclonal antibody produced by hybridoma cell line No. 930720117

SUBSTITUTE SHEET (RULE 26)

BEST AVAILABLE COPY

FIG. 2(a)

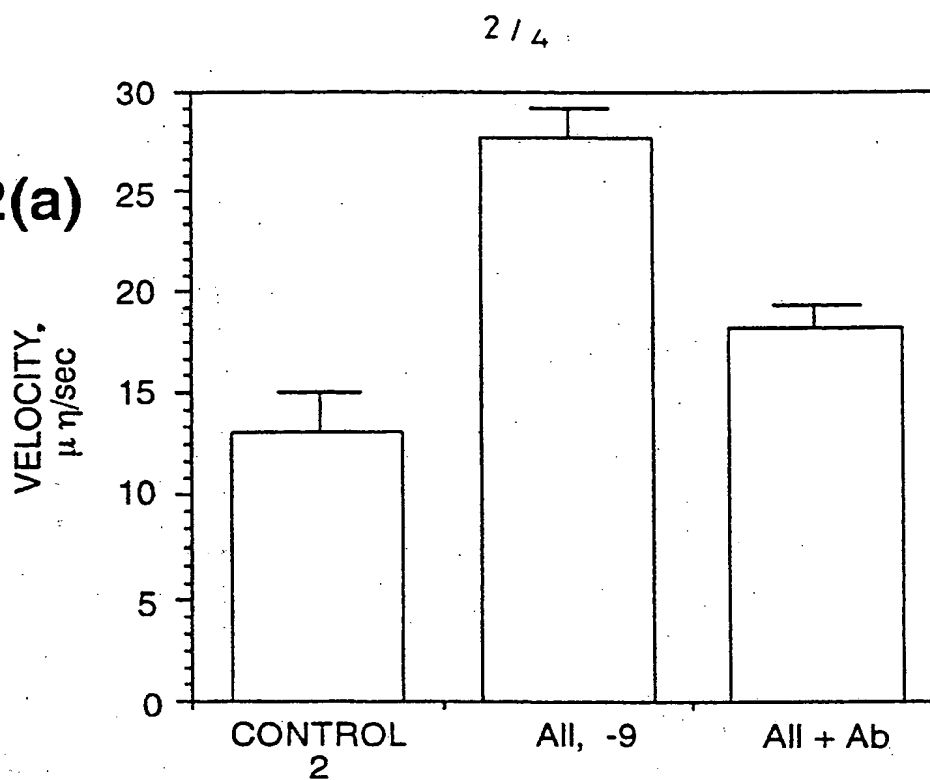
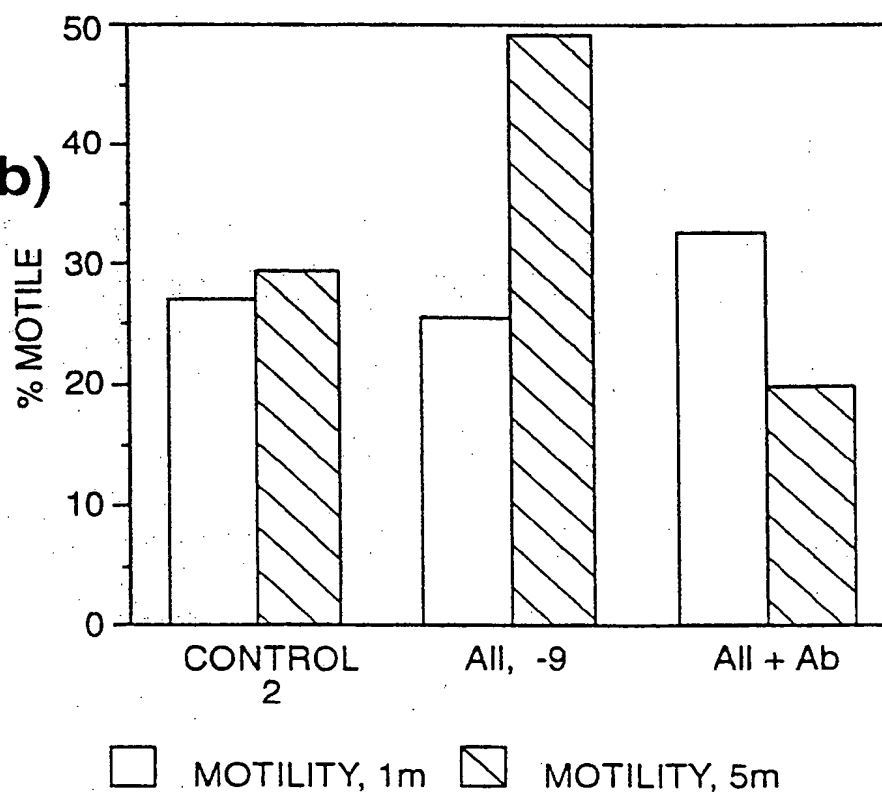


FIG. 2(b)



SUBSTITUTE SHEET (RULE 26)

3/4

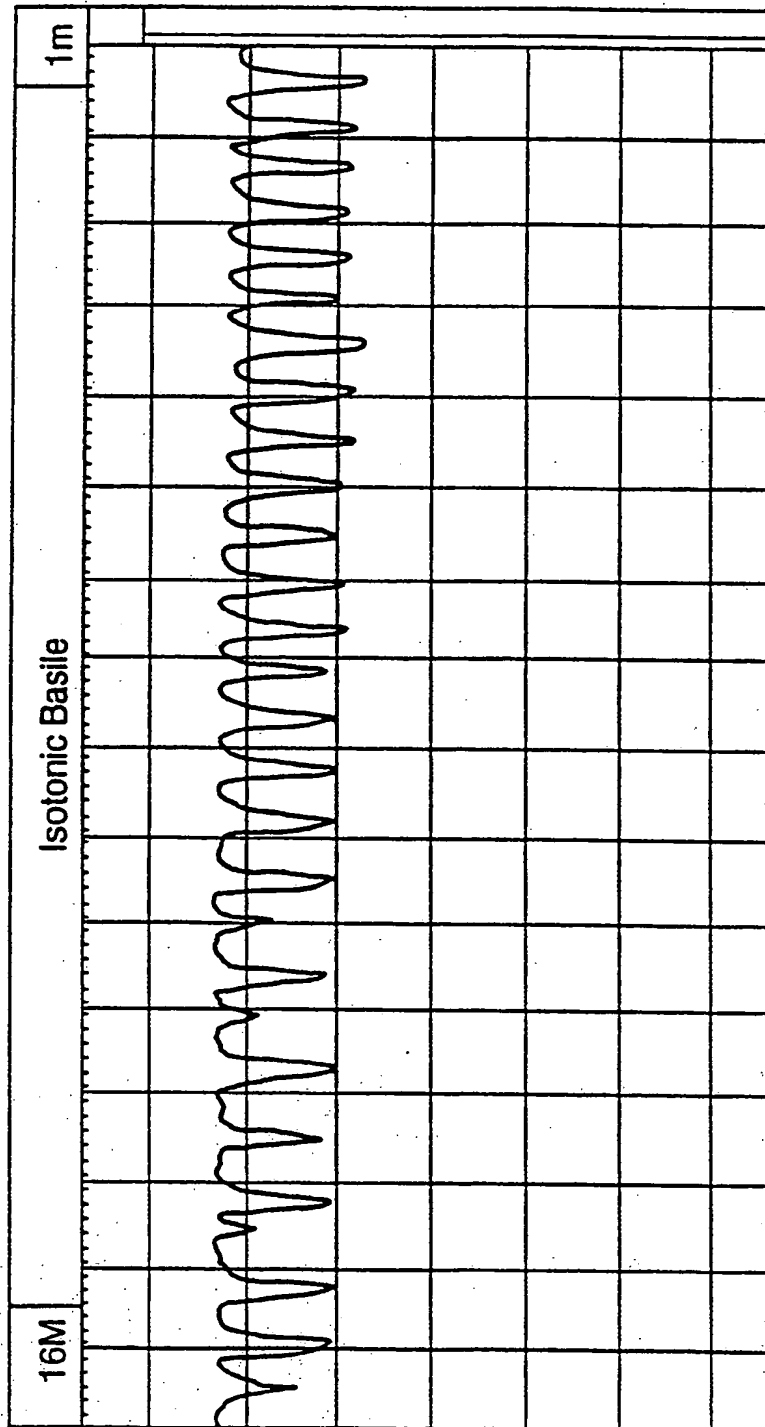
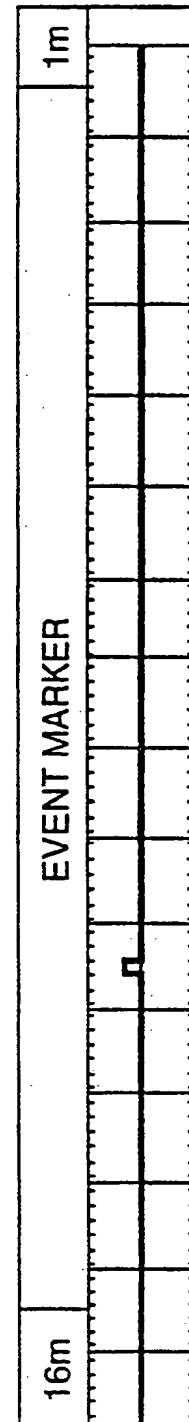


FIG. 3(a)

↑(A)



10^{-10}

5 Hz on channels: 0 1

Recording to file : bas1008.CFS

F1 Help 2 NxtWind 3 Unlock 4 Clock 5 Zoom In 6 Update 7 Pause 8 Filing 9 Config 10 Quit

4 / 4

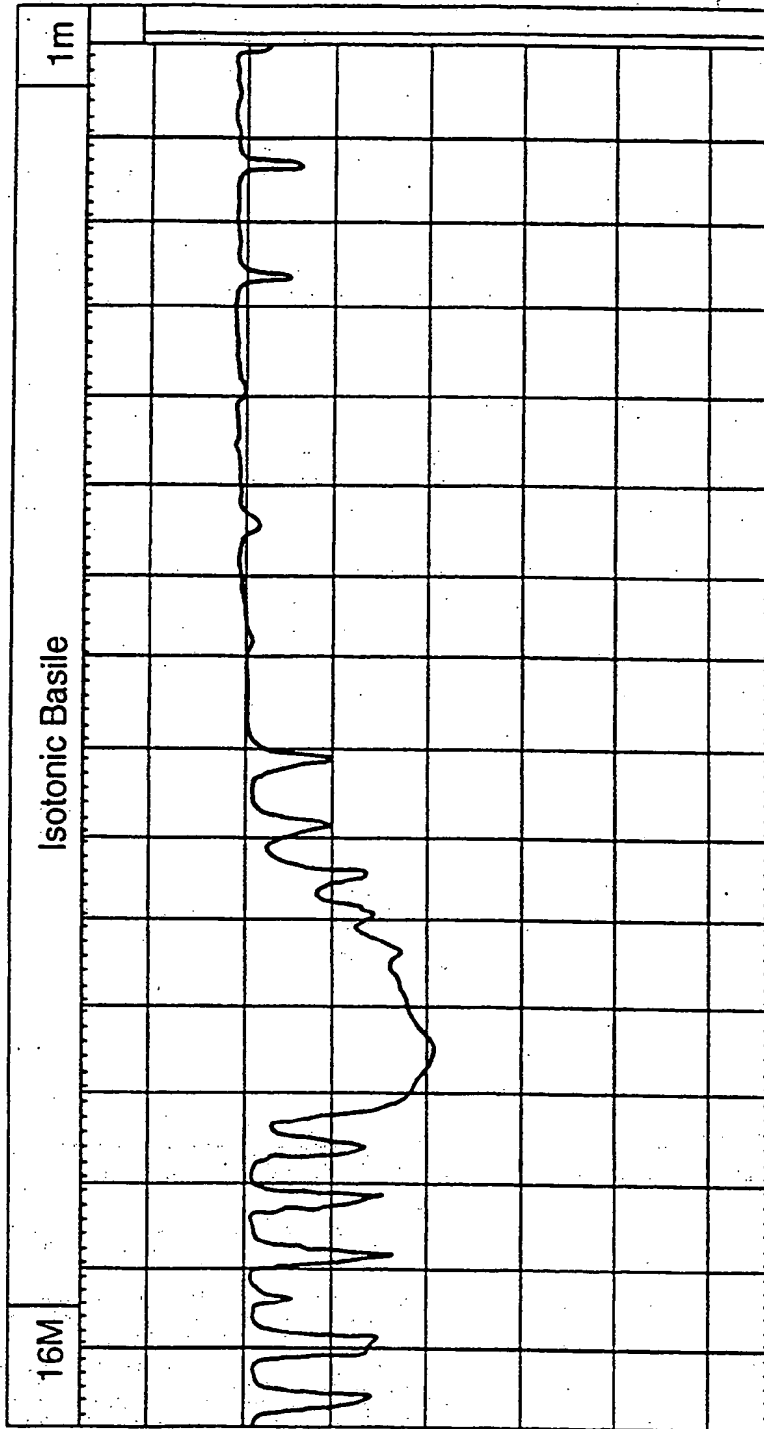
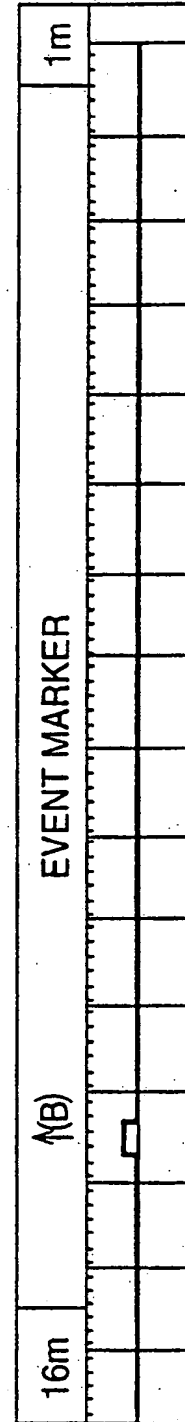


FIG. 3(b)



5 Hz on channels: 0 1
 Recording to file : bas1008.CFS
 F1 Help 2 NxtWind 3 Unlock 4 Clock 5 Zoom In 6 Update 7 Pause 8 Filing 9 Config 10 Quit

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 94/02100

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: C07K 16/28, C07K 14/72, C12N 5/00, A61K 39/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: C07K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT


Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Dialog Information Service, file 154, Medline, Dialog accession no. 06136659, Medline accession no. 87110659, Couraud P0: "Anti-angiotensin II anti-idiotypic antibodies bind to angiotensin II receptor", J Immunol (UNITED STATES) Feb 15 1987, 138 (4) p1164-8	1,5,8-11
Y	---	1-11
X	SCIENCE, Volume 257, July 1992, K. Christopher Garcia et al, "Three-Dimensional Structure of an Angiotensin II-Fab Complex at 3 Å: Hormone Recognition by an Anti-Idiotypic Antibody", page 502, see page 503, left column	1,5,8-12

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

- | | |
|--|--|
| <ul style="list-style-type: none"> * Special categories of cited documents "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed | <ul style="list-style-type: none"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family |
|--|--|

Date of the actual completion of the international search	Date of mailing of the international search report
24 January 1995	22-02-1995

Name and mailing address of the International Searching Authority Authorized officer

 European Patent Office, P.B. 5818 Patendaan 2
NL-2230 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl
Fax: (+31-70) 340-3016

CARL OLOF GUSTAFSSON

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 94/02100

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	National Library of Medicine (NLM), file Medline, Medline accession no. 93226754, Pfister J: "Immunohistochemical demonstration of angiotensin II receptors in rat brain by use of an anti- idiotypic antibody", Regul Pept 1993 Mar 19;44(2): 109-17 --	1,5,8-11
X	National Library of Medicine (NLM), file Medline, Medline accession no. 92198471, Zelezna B, "Characterization of a polyclonal anti-peptide antibody to the angiotensin II type-1 (AT1) receptor", Biochem Biophys Res Commun 1992 Mar 16; 183(2):781-8 --	1,5,8-11
Y	--	1-11
X	National Library of Medicine (NLM), file Medline, Medline accession no. 93279775, Richards EM: "Inhibition of central angiotensin responses by angiotensin type-1 receptor antibody", Hypertension 1993 Jun;21(6 Pt 2):1062-5 --	1,5,8-12
Y	--	1-11
A	Dialog Information Services, file 154, Medline, Dialog accession no. 08601558, Medline accession no. 93311558, Paxton WG: "Immunohistochemical localization of rat angiotensin II ATI receptor", Am J Physiol (UNITED STATES) Jun 1993, 264 (6 Pt 2) pF989-95 --	1-11
A	National Library of Medicine (NLM), file Medline, Medline accession no. 93226769, Phillips MI: "Immunohistochemical mapping of angiotensin ATI receptors in the brain", Regul Pept 1993 Mar 19; 44(2):95-107 --	1-11

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 94/02100

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	<p>Dialog Information Services, file 154, Medline, Dialog accession no. 08813213. Medline accession no. 94128213, Barker S et al: "A monoclonal anti- body to a conserved sequence in the extracellular domain recognizes the angiotensin II ATI receptor in mammalian target tissues", J Mol Endocrinol (ENGLAND) Oct 1993, 11 (2) p241-5</p> <p style="text-align: center;">-- -----</p>	1-11

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 94/02100

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

Remark: Although claims 12 and 13 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compounds (Rule 39.1(iv) PCT).
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.